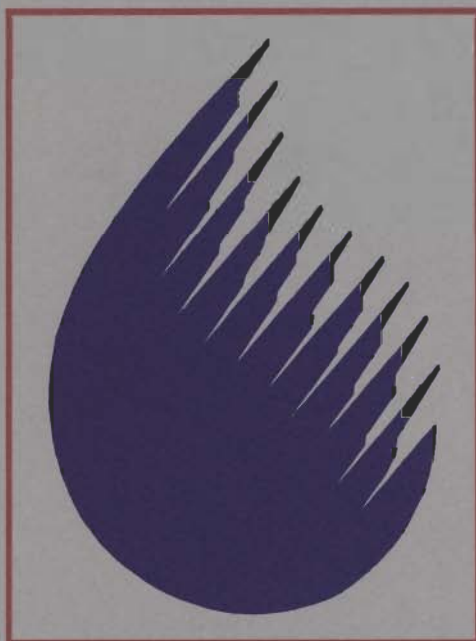


# **SOUTHERN NEVADA WATER AUTHORITY**



## **Water Resource Plan**

**January 1996**





# Southern Nevada Water Authority

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## EXECUTIVE SUMMARY

At the end of Phase 1 of the Authority's Integrated Resource Planning process in June 1995, the Authority Board approved 19 recommendations (see APPENDIX) made by the IRP citizen Advisory Committee (IRPAC) and directed staff to proceed with the recommendations. One recommendation stated that a water resources plan should be formulated to meet future water demands that utilizes all available water supplies, including unused apportionments, surpluses, leases and other water supplies. The intent of this document is to show projected water demands for the region and how the Authority intends to meet those demands, through the year 2050. Chapter I provides a brief description of the Authority and its IRP process. Chapter II provides water demand projections with conservation. Chapter III describes existing water resources, and Chapter IV describes future resource options.

Chapter V concludes that the Authority should be able to meet projected water demands for the next 30 to 35 years, with responsible conservation and full utilization of the Authority's existing water resources, including unused lower Colorado River division states' apportionments. Water demands can be met from now until approximately 2010 by fully utilizing the Authority's existing long-term water supplies -- reclaimed water, groundwater and Colorado River water -- and continuing its conservation efforts. To meet water demands beyond the year 2010, the Authority believes its best option is to exercise its 1992 contractual right to a portion of the unused apportionments of the lower Colorado River. Extensive river modeling shows that there most likely will be enough unused apportionment to sustain Nevada's water demands until some time after the year 2025. However, it is only an interim supply, and there are many uncertainties associated with its availability. Therefore, the Authority must continue to aggressively pursue long-term resources.

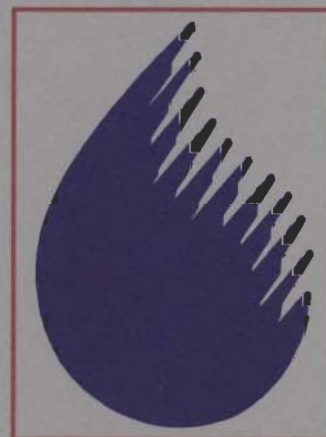
To meet water demands beyond the year 2025, future resource possibilities for the Authority are the use of the Las Vegas Valley shallow aquifer, construction of a Virgin River pipeline, construction of the Cooperative Water Project (CWP) to bring groundwater from Nevada's southeastern counties, and additional Colorado River water. Utilization of the shallow aquifer has already begun in a few locations in the Valley and could eventually be fully developed.

To meet its immediate facility needs, the Authority has begun expansion of its existing Colorado River facilities. To meet its longer-term resource needs, the Authority is focusing its efforts on acquiring additional Colorado River water, most of which would be delivered through existing facility corridors, with the hope that construction of a Virgin River pipeline or a CWP will not be necessary. If additional Colorado River water does not materialize, however, the Authority must pursue other resources, to ensure a long-term, reliable water supply for the community.

It is anticipated that this Plan will be updated annually, as demand projections are revised and as some of the uncertainties surrounding the future resource options become resolved.







**CHAPTER I:**  
**Introduction/Background**

## **CHAPTER I**

### **INTRODUCTION/BACKGROUND**

#### **SOUTHERN NEVADA WATER AUTHORITY (SNWA)**

Southern Nevada Water Authority (SNWA or "Authority") was created in 1991 through a cooperative agreement among the seven regional water and wastewater agencies:

- \* Big Bend Water District
- \* Boulder City, City of
- \* Clark County Sanitation District
- \* Henderson, City of
- \* Las Vegas, City of
- \* Las Vegas Valley Water District
- \* North Las Vegas, City of

The purposes of the Authority are to seek new water resources for Southern Nevada, to manage existing and future water resources, to construct and manage regional water facilities, and to promote responsible conservation.

#### **SERVICE AREAS**

Potable water in the Las Vegas region is provided by five different water purveyors. Big Bend Water District provides water service to the community of Laughlin; the cities of Boulder City and Henderson provide water to their respective communities. The Las Vegas Valley Water District provides water to the City of Las Vegas and to portions of unincorporated Clark County; the City of North Las Vegas provides water within its boundaries and to adjacent portions of unincorporated Clark County and the City of Las Vegas.

Wastewater service in the Las Vegas region is provided by four different agencies. The cities of Boulder City and Henderson each provide wastewater service to their communities. The City of Las Vegas collects and treats wastewater for customers within its boundaries; the City of North Las Vegas collects its wastewater and then sends it to the City of Las Vegas for treatment. Clark County Sanitation District provides wastewater facilities for unincorporated Clark County in the Las Vegas Valley and the community of Laughlin.

#### **SNWA INTEGRATED RESOURCE PLANNING PROCESS**

In April 1994, the Authority began an integrated resource planning (IRP) process to aid the Authority Board in selecting the appropriate combination of resources, facilities and conservation programs to meet future water demands in Southern Nevada. IRP brings important concepts to traditional resource and facility planning that include: involvement of the public early in the planning process, analysis of supply-side (resources and facilities) and demand-side

(conservation) solutions; consideration of different community goals, and analysis of the tradeoffs among different, sometimes conflicting goals.

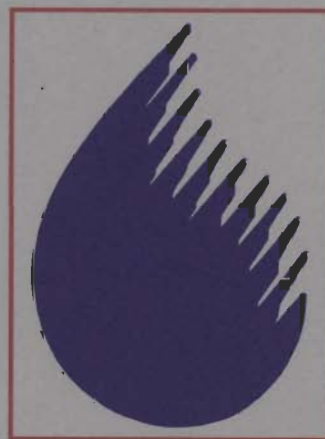
In June 1994, the Authority Board created the SNWA Integrated Resource Plan Advisory Committee (IRPAC), consisting of 21 citizens from the local community. As a part of the IRP process, IRPAC reviewed and discussed the technical work provided to them throughout the process by Authority staff and finalized 19 recommendations.

In June 1995, the Board adopted the 19 recommendations, including the following three on water resources.

- 1.1 Seek permanent, long-term water supplies. However, a water resources plan should be formulated to meet future water demands that utilizes all available water supplies, including unused apportionments, surpluses, leases and other water supplies.
- 1.2 Place top priority on development of Colorado River water to meet future water demands over development of a Virgin River pipeline or a Cooperative Water Project.
- 1.3 Maximize the use of the Las Vegas Valley shallow aquifer, when and where practical.

This Resource Plan (Plan) is a result of recommendation 1.1. Future resource options are prioritized in this Plan in accordance with recommendations 1.2 and 1.3.





## **CHAPTER II:** **Annual water demands**

## **CHAPTER II**

### **ANNUAL WATER DEMANDS**

Table II.1 shows potable and non-potable annual water demand projections through 2030. Demands in this Plan cover the SNWA purveyor service areas as a whole, since the intent of the Resource Plan is to focus on the resources available to the region. Furthermore, in a rapidly growing region like Las Vegas, it is difficult to predict the quantity of water demands with any accuracy beyond a few years and even more difficult to determine the location of water demands within a region.

TABLE II.1 SNWA PURVEYOR ANNUAL DEMANDS (POTABLE AND NON-POTABLE) (ACRE-FEET PER YEAR)							
1995	2000	2005	2010	2015	2020	2025	2030
368,800	436,200	502,000	553,400	584,400	603,400	619,300	635,400

Population and employment projections were made by the University of Nevada at Las Vegas (UNLV)<sup>1</sup> and used by Planning and Management Consultants, Ltd.(PMCL)<sup>2</sup> to generate water demands. The demands in this plan are PMCL's demands, increased slightly to account for changes in resort room calculations made after the UNLV and PMCL reports were published.

While projections cover 1995 through the year 2030, they should be continually updated, particularly in a rapidly growing region where they become rapidly out of date. A challenge for water planners, then, is the need to have firm numbers from which to design facilities versus the acknowledgement that the firm numbers are always changing.

The PMCL demand numbers include reductions based on the assumption that the following conservation and pricing measures are in place:

- \* Low water landscape requirements
- \* Plumbing retrofits
- \* "Cash for Grass" (turf retrofit)
- \* Doubling of water rates within the next 10 years.

During the IRP process, it became obvious that conservation could extend the time frames when

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<sup>1</sup> "Southern Nevada's Long-Term Economic Development: Projections for Natural Maturation," Center for Business and Economic Research, University of Nevada, Las Vegas, December 1994.

<sup>2</sup> "Assessment of Future Water Demands and Conservation Savings in the Southern Nevada Region: A Dynamic Planning Effort," Planning and Management Consultants, Ltd, November 1994.

additional resources and facilities are needed. As a result, the Board adopted a number of recommendations on conservation, including one that required a 10 - 15% reduction in maximum day usage by summer 2000.

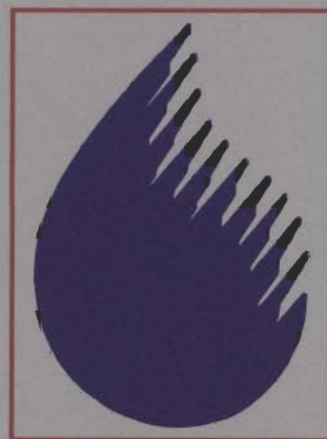
The measures included in the demand projections in this report are expected to reduce usage by 10 - 15% by 2000. As the dollar costs and water savings of various measures are studied more closely, though, the list will undoubtedly change. These particular measures were included because they seemed reasonable and attainable, but they all may not be required or implemented.

A more general set of measures has been agreed to among the purveyors in their Conservation Memorandum of Understanding (MOU), adopted in early 1995. The MOU is SNWA's response to draft regulations of the Bureau of Reclamation that require Bureau customers to implement conservation measures called "Best Management Practices." The MOU is an important first step in implementing more consistent conservation measures across SNWA purveyor service area boundaries.

The conservation component of demand projections will continue to change, as research efforts refine current estimates of impacts of various pricing policies and conservation measures.







**CHAPTER III:**  
**Existing water resources**

## CHAPTER III

### EXISTING WATER RESOURCES

Table III.1 (below) and Figure III.1 show the existing resources of the Authority and its purveyor members.

TABLE III.1 SNWA PURVEYOR EXISTING RESOURCES (POTABLE AND NON-POTABLE) (ACRE-FEET PER YEAR)												
	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Reclaimed water	21,800	21,800	21,800	21,800	21,800	21,800	21,800	21,800	21,800	21,800	21,800	21,800
Groundwater	45,497	45,497	45,497	45,497	45,497	45,497	45,497	45,497	45,497	45,497	45,497	45,497
Colorado R. water (pre-SNWA)	342,161	342,161	342,161	342,161	342,161	342,161	342,161	342,161	342,161	342,161	342,161	342,161
Colorado R. water (SNWA)	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000
Colorado R. water (Edison)	41,400	41,400	41,400	41,400	41,400	41,400	41,400	41,400	41,400	41,400	41,400	41,400
Colorado R. water (BMI)	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100	26,100
Colorado R. water (unused lower division states' apportionments) (a)	395,317	352,951	349,951	307,099	240,919	164,533	111,961	961	0	0	0	0
Total	930,275	887,909	884,909	842,057	775,877	699,491	646,919	535,919	534,958	534,958	534,958	534,958

#### NOTES

(a) See Table A-3.

### GROUNDWATER

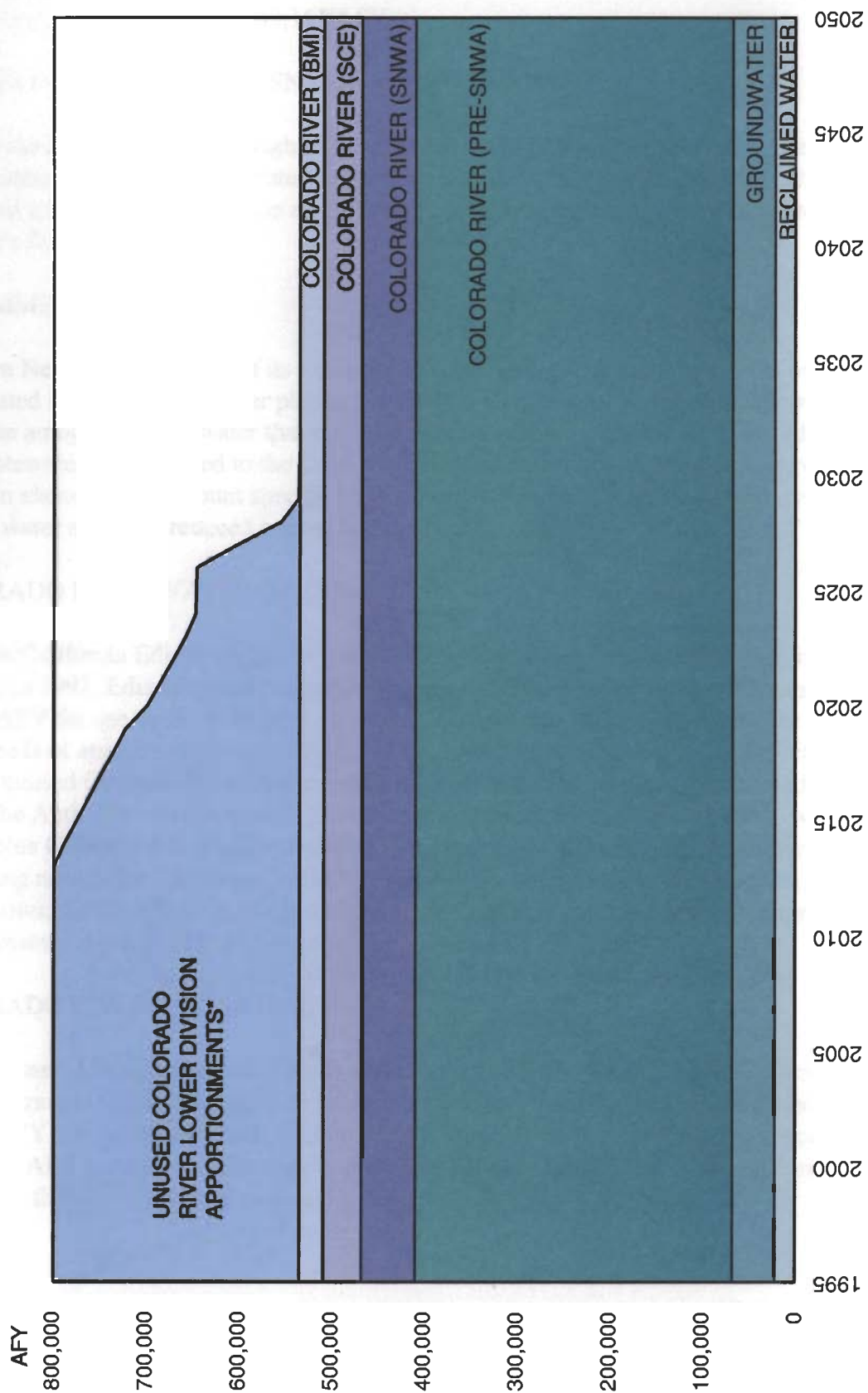
Las Vegas Valley Water District and North Las Vegas each have 39,786 acre-feet per year (AFY) and 5,711 AFY respectively of groundwater rights.

### COLORADO RIVER WATER (PRE-SNWA)

Under the Boulder Canyon Project Act of 1928 and confirmed by the 1964 Arizona v. California Supreme Court Decree, Nevada has a "consumptive use" apportionment of 300,000 AFY of Colorado River water. Consumptive use is defined as diversions minus return flows. Return flows in Nevada consist mainly of treated Colorado River wastewater that is returned to the Colorado River at Lake Mead via the Las Vegas Wash and at Laughlin, Nevada. With return flow credits, then, Nevada can actually divert more than its 300,000 AFY apportionment, as long as the net use is no more than 300,000 AFY.

Prior to the creation of the Authority in 1991, allocations to individual purveyors and to purveyors utilizing the regional treatment and transmission facility called the "Southern Nevada Water System" were in the form of diversion rights contracts, under the assumption that a certain

FIGURE III.1:  
SNWA PURVEYOR EXISTING RESOURCES



\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

portion of the diversions would be returned to the River for return flow credit. Diversion rights held by the purveyors totalled 342,161 AFY.

#### COLORADO RIVER WATER (SNWA)

In 1992 the Authority acquired rights to the remainder of Nevada's consumptive use apportionment that was not allocated under other contracts. This unallocated apportionment translated into an annual diversion of 58,000 AF, assuming a portion was returned to the River for return flow credits.

#### RECLAIMED WATER

Southern Nevada reclaims all of its wastewater, either through return flow credits or direct reuse by irrigated landscape and power plants. The SNWA Cooperative Agreement, adopted in 1991, limits the amount of wastewater that could be directly reused to 21,800 AFY, in order to ensure that wastewater was returned to the Colorado River for return flow credits. If wastewater is reused in excess of the amount specified to the purveyor in the Agreement, the purveyor's potable water supply is reduced correspondingly.

#### COLORADO RIVER WATER (EDISON)

Southern California Edison (Edison) operates the Fort Mohave Generating Station in Laughlin, Nevada. In 1993, Edison agreed to give up its Colorado River water consumptive use contract of 23,000 AFY for use by the Authority. In return, the Authority agreed to provide the Station's water needs of approximately 16,000 AFY through July 2026. The Authority expects there to be enough unused Colorado River water available to Nevada to meet the Station's needs through 2007. The Authority intends to meet Station's needs from 2007 through July 2026 with unused and surplus Colorado River water available to Nevada or with water that the Authority purveyors are storing now in the Las Vegas Valley groundwater basin through artificial recharge. With return flows, the 23,000 AFY of consumptive use ultimately available to the Authority, becomes approximately, 41,400 AFY of diversions.

#### COLORADO RIVER WATER (BMI)

In 1994, Basic Management, Inc. (BMI) agreed to transfer 14,550 AFY of its Colorado River water contract to the Authority. With return flow credits, this will allow an estimated diversion of 26,100 AFY. Of the 26,100 AFY, 23,600 AFY is allocated to the Authority purveyor members, and 2,500 AFY is held by the Authority for Victory Valley (a BMI development company) projects in the purveyors' service areas.

## COLORADO RIVER WATER (UNUSED LOWER DIVISION STATES' APPORTIONMENT)<sup>3</sup>

Under the 1992 SNWA delivery contract between the Authority and the Secretary of the Interior<sup>4</sup>, the Authority has the right to the use of Nevada's 300,000 AFY consumptive use apportionment. Table A.1 in the Appendix shows the resources available to each of the Nevada non-SNWA Colorado River water users, their projected water demands, and the remaining unused apportionment available for use by the Authority.

In addition, the Authority can use the unused apportionments of the states of Arizona and California. Since California is currently using all of its 4.4 million AFY apportionment, any unused apportionment available to Nevada will come from Arizona. The amount of water obtainable by the Authority will depend on quantity of water available as unused apportionment and allocation of the unused apportionment.

The quantity of water available as unused apportionment is greatest now and is expected to diminish as Arizona's use of Colorado River water increases over time. Any use of Arizona's unused apportionments by the Authority will not occur until Nevada's 300,000 AFY apportionment is fully utilized.

Allocations of unused apportionment are made by the Secretary of the Interior. Currently, the Metropolitan Water District of Southern California is the only entity using unused apportionments in any appreciable amount. Nevada's increasing need for additional water, however, will increase the competition for the use of unused apportionments. In this Resource Plan, the amount of unused apportionment assumed to be available to Nevada under the 1992 SNWA delivery contract is based on the following method for allocating Arizona's unused apportionments:

Nevada would receive the first 60,000 acre-feet for direct use or off-stream banking and California would receive the second 60,000 acre-feet for direct use or off-stream banking. The remainder would be split 27 percent to Nevada and 73 percent to California.

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<sup>3</sup> Sometimes the phrases "lower division states" and "lower basin states" are used interchangeably. However, this document follows the definitions found in the "Upper Colorado River Basin Compact, 1948" Article II. Paraphrased, the lower division states are Arizona, California and Nevada; the lower basin states are Arizona, California, Nevada, New Mexico and Utah.

<sup>4</sup> "Amended and Restated Contract with the Southern Nevada Water Authority, Nevada, for the Delivery of Colorado River Water" (Contract No. 2-07-30-W0266), among Bureau of Reclamation, State of Nevada, and the Authority.

This method was developed as a part of a larger regional solution by Arizona, California, Nevada, Reclamation, and the Lower Colorado River Indian Tribes. Although the process for developing a regional solution was never approved or finalized, this methodology appears to be the best candidate for allocating unused apportionments in the future.<sup>5</sup>

Table A.2 in the Appendix shows the diversion amounts projected to be available to the Authority from Arizona's unused apportionment, using the above-discussed assumptions and with return flow credits.

Table A.3 in the Appendix shows the diversion amounts projected to be available to the Authority, both from Nevada, non-SNWA unused apportionments and Arizona unused apportionments.

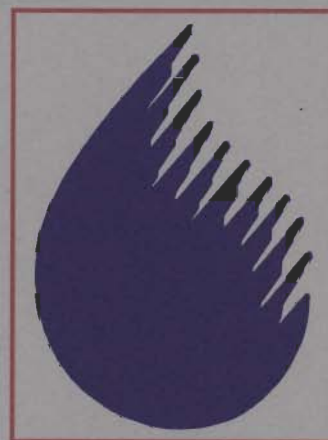
#### COLORADO RIVER WATER (SURPLUS FLOW)

Surplus flow is any water made available for release, as determined by the Secretary of the Interior, to satisfy consumptive use in the lower division states in excess of 7.5 million AFY. As stated in Arizona v. California, Nevada would receive four percent of the surplus.<sup>6</sup> At this time, projections of quantities of surplus flows have not been made, nor is it known how any unused surplus would be shared among the states.

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<sup>5</sup> "Progress Report No. 4," June 1, 1995, Lower Colorado River Basin Technical Committee.

<sup>6</sup> Supreme Court Decree (March 9, 1964, 376 U.S. 340) in Arizona v. California, II(B)(2).



**CHAPTER IV:**  
**Future resource options**

## **CHAPTER IV**

### **FUTURE RESOURCE OPTIONS**

As shown in Figure IV.1, demands surpass supplies, including unused apportionments, before 2030. Additional resources must be acquired to meet demands beyond that time period. As a part of the analysis in the Authority's Integrated Resource Planning process, the following future resource possibilities or "options" were considered:

- \* Shallow aquifer
- \* Virgin River/Muddy River
- \* Cooperative Water Project
- \* Colorado River water transfers and banking
- \* Stormwater
- \* Exchanges/Desalinization
- \* Agricultural to municipal water conversion

The following sections include brief descriptions of each option and its status; the last section is a summary of the Authority's position on the use of these options.

#### **SHALLOW AQUIFER**

A future resource option for the Authority is the shallow aquifer, as shown in Figure IV.2. The shallow perched aquifer system in the Las Vegas Valley has developed mostly from excess irrigation water that has not been consumed in the root zone and has travelled downward until most of it is stopped by an impermeable layer of clay or caliche. The water then remains near the land surface, where portions evaporate or transpire to the atmosphere, or it migrates generally toward the Las Vegas Wash<sup>7</sup>, where a portion becomes a part of Nevada's return flow credits. In the lower elevations of the Valley, this water is causing or has caused damage to structures and is considered a nuisance.

While the location and extent of the shallow aquifer has been fairly well determined from monitoring wells throughout the Valley<sup>8</sup>, the quantity is less certain. During the IRP process, a range of 10,000 - 20,000 AFY was estimated and will need to be refined. The shallow aquifer is also a finite resource. As outdoor conservation increases, the source of the water -- excess irrigation -- could possibly decrease.

In terms of water quality, the shallow aquifer is poor, its total dissolved solids (TDS) exceeding

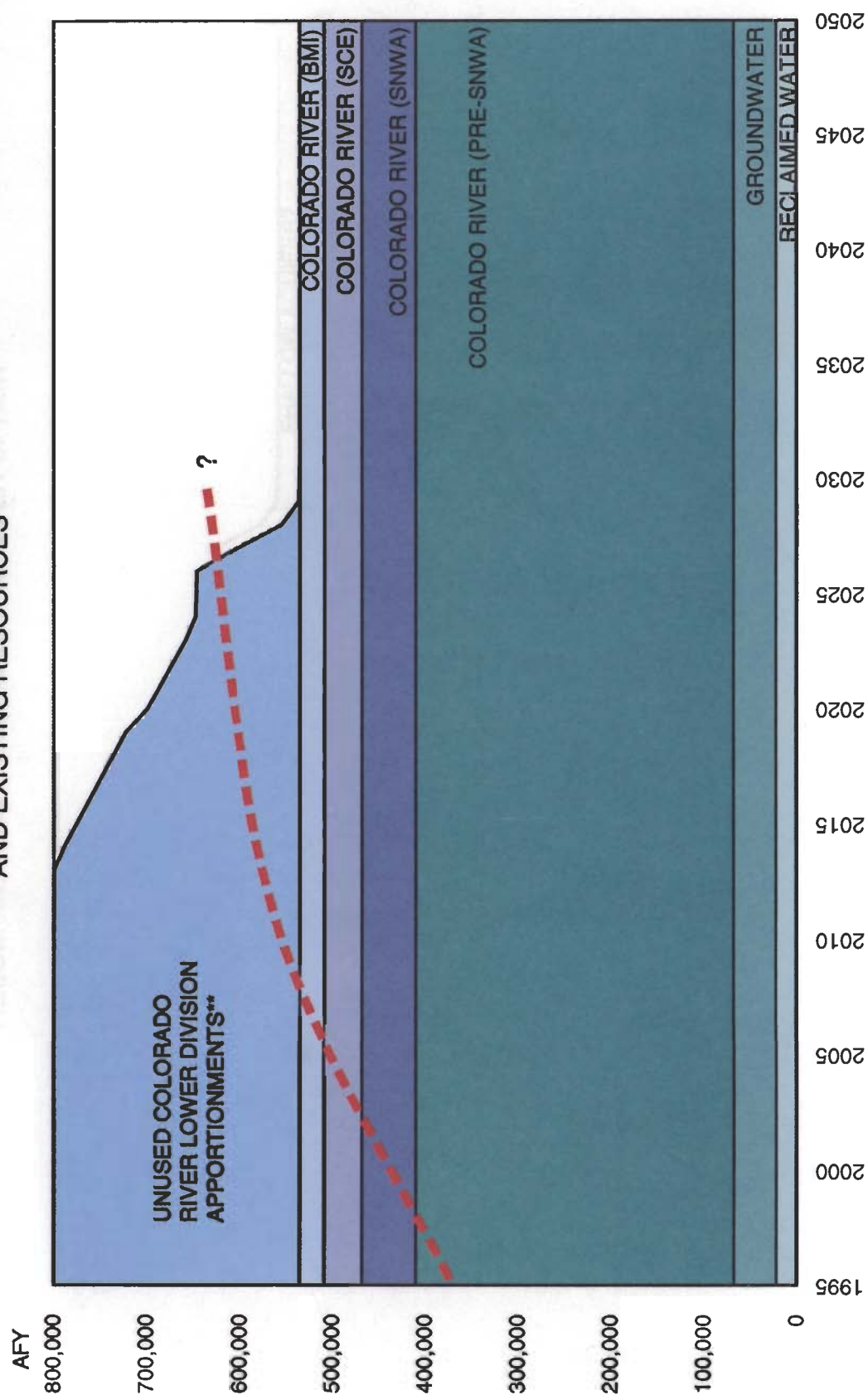
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<sup>7</sup> "The Shallow Aquifer System in Las Vegas Valley, Nevada," August 1991, Las Vegas Valley Water District Department of Research.

<sup>8</sup> Ibid.



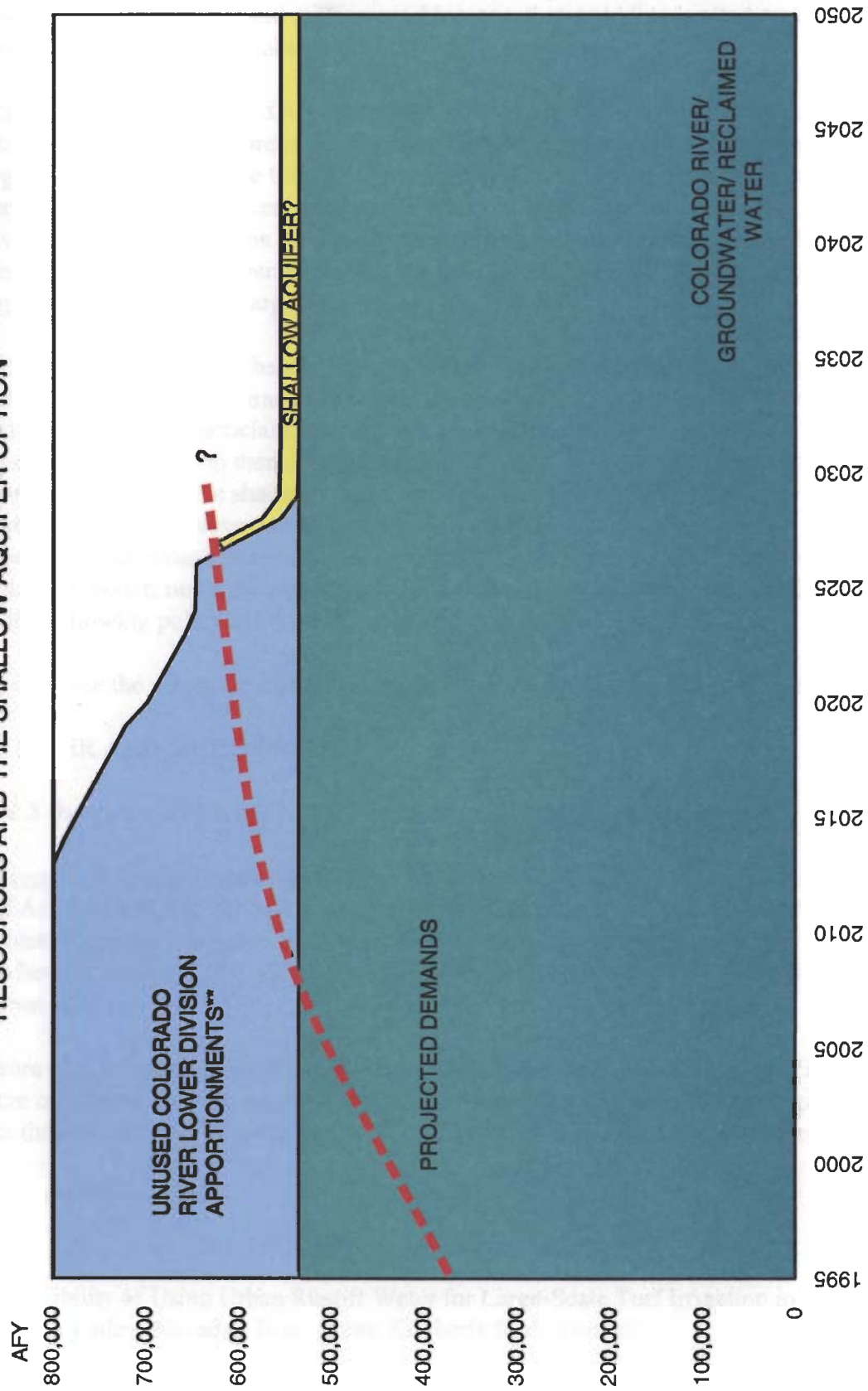
FIGURE IV.1:  
SNWA PURVEYOR DEMANDS\*  
AND EXISTING RESOURCES



\*Includes potable and non-potable demands.

\*\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

FIGURE IV.2:  
SNWA PURVEYOR DEMANDS\*, UNUSED APPORTIONMENTS, OTHER EXISTING  
RESOURCES AND THE SHALLOW AQUIFER OPTION



\*Includes potable and non-potable demands.

\*\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

acceptable drinking water standards in most locations.<sup>9</sup> However, it may not need to be treated to potable standards; instead, it could replace potable water that would normally be used for irrigation or be blended with potable water and used for irrigation.

In general, infrastructure required to capture and deliver a resource that is spread throughout the Valley in small quantities is more expensive than the use of other resources that have the advantage of economies of scale through centralized facilities. On the other hand, studies are underway that show there are some sites where shallow aquifer facilities could pay for themselves in a matter of months.<sup>10</sup> Furthermore, use of the shallow aquifer means less of other resources like the Colorado River need to be treated and delivered through large facilities, thus reducing the demand on those large facilities.

Acquisition of rights to utilize the shallow aquifer requires permits from the Nevada State Engineer's office, if it can be demonstrated that the source of the water is from over-irrigation and that it can be put to beneficial use; thus, this option holds relatively fewer legal complications for acquisition than do other resource options. Furthermore, while utilization of any significant portion of the shallow aquifer will require a great deal of work, it is at least a fairly certain resource, however small, compared to the other options. This relative certainty, coupled with the advantage of reducing demand on large facilities and the need to do something with "nuisance" water, make the shallow aquifer a desirable option to pursue. Thus, the Board adopted the following policy in June 1995:

1.3 Maximize the use of the Las Vegas Valley shallow aquifer, when and where practical.

#### VIRGIN RIVER AND MUDDY RIVER

Figure IV.3 shows the Virgin and Muddy rivers as future resource possibilities.

Virgin River. The Virgin River originates in southwestern Utah, flows through the northwestern corner of Arizona, and into Nevada where it joins the Colorado River at Lake Mead. In 1994, the Nevada State Engineer granted to the Authority the annual maximum diversion rights to Virgin River surface flows of 190,000 AFY with a not-to-exceed amount of 113,000 acre-feet average annual diversion.

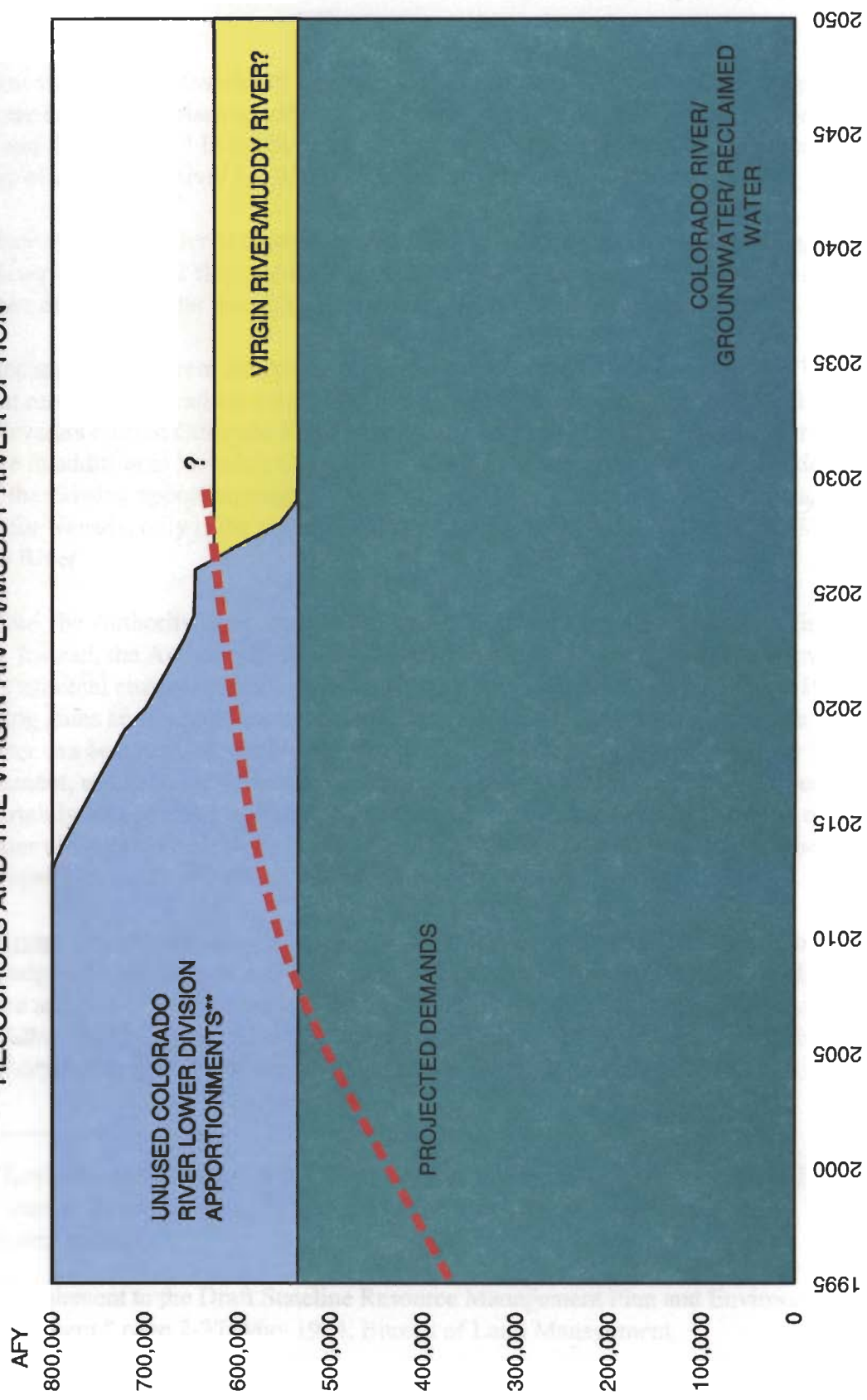
The capture of this resource would involve the creation of a diversion dam on the Virgin River, a 1,860-acre off-stream storage reservoir, and a 70-mile pipeline to the Las Vegas region. Cost to construct these facilities is an estimated \$638 million in 1994 dollars. Once delivered to the Las

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<sup>9</sup> Ibid.

<sup>10</sup> "Feasibility of Using Urban Runoff Water for Large-Scale Turf Irrigation in Southeast Las Vegas Valley, Nevada," in progress, Kimberly S. Zickmund.

FIGURE IV.3:  
SNWA PURVEYOR DEMANDS\*, UNUSED APPORTIONMENTS, OTHER EXISTING  
RESOURCES AND THE VIRGIN RIVER/MUDDY RIVER OPTION



\*Includes potable and non-potable demands.

\*\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

Vegas region, the water still requires treatment and distribution to local purveyors, at additional cost.

Environmental concerns associated with construction of these facilities include the presence of several rare or sensitive plant species and a number of threatened, endangered and sensitive wildlife and fish species.<sup>11</sup> In addition, the Bureau of Land Management wants to determine the eligibility of the Virgin River for Wild and Scenic River designation.<sup>12</sup>

The Authority would prefer to capture its Virgin River water rights through wheeling, whereby Virgin River water would flow naturally through its channel to Lake Mead, and the Authority would then divert the water through existing and planned Colorado River facilities.

Under Reclamation's current interpretation of the "Law of the River," however, the Virgin River flows that reach Lake Mead are considered to be a part of the Colorado River and, therefore, a part of Nevada's current Colorado River apportionment. Thus, wheeled Virgin River water is not a resource in addition to Nevada's Colorado River apportionment; the Bureau considers it merely a part of the existing apportionment. Nevada's Virgin River water rights would be an additional resource for Nevada, only if the pipeline diverted that water before it reached Lake Mead and the Colorado River.

At this time, the Authority has chosen not to pursue further the construction of Virgin River facilities. Instead, the Authority is focusing on the pursuit of resources that would involve relatively minimal environmental impact and less cost, namely the Colorado River. If the concept of wheeling gains acceptability or becomes legally interpreted in such a way that the Virgin River water can be a resource for Nevada in addition to Nevada's existing Colorado River apportionment, utilization of Virgin River water without construction of Virgin River facilities would certainly be a preferable option to the Authority. Parenthetically, the amount of Virgin River water ultimately available to Nevada could be affected by interstate negotiations and possible upstream needs of Arizona and Utah.

Muddy River. The Muddy River is a perennial river fed by the Muddy Springs in Southern Nevada, originating in Nevada and flowing into Lake Mead. It all currently is used for agriculture and power generation; at the most, 5,000 acre-feet per year may come available through fallowing farm land and selling those water rights to the Authority for municipal use. If the Authority builds a Virgin River pipeline, it may be feasible to extend facilities to include

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<sup>11</sup> "Environmental Report of the Virgin River Water Resource Development Project, Clark County, Nevada," 1992; Woodward Clyde, Dames and Moore; and the Las Vegas Valley Water District.

<sup>12</sup> "Supplement to the Draft Stateline Resource Management Plan and Environmental Impact Statement," page 2-37, May 1994, Bureau of Land Management.



Muddy River water. If wheeling becomes available, the Authority may be able to acquire Muddy River rights and wheel the water via Lake Mead.<sup>13</sup>

## COOPERATIVE WATER PROJECT

In 1989, the Las Vegas Valley Water District filed 146 applications with the State Engineer's Office to appropriate unallocated water resources in twenty-seven basins. Because of potential environmental concerns, existing appropriations, and low benefit/cost ratios, however, the District withdrew some applications, limiting proposed diversions to a maximum of 180,000 AFY in sixteen basins. At this time, the applications are on hold at the State Engineer's office until either the District or the Authority chooses to pursue the project.

Figure IV.4 shows the Cooperative Water Project (CWP) as a future resource option. The CWP involves the collection and transmission of up to 180,000 AFY of groundwater to Las Vegas from sixteen hydrologic basins in the four Nevada counties of Clark, Lincoln, Nye and White Pine counties. Estimated cost of construction in 1994 dollars is 1.8 billion dollars.

For now, neither the District nor the Authority are pursuing construction of the CWP, for a number of reasons. The immediate problem facing the Authority is lack of facility capacity. The Authority had to make a choice among constructing additional Colorado River facilities at Lake Mead, the CWP or a Virgin River pipeline. The pipeline is not a desirable option at this time, as already discussed. Neither is the CWP, with its potential environmental issues, lack of public support, and low benefit/cost ratio. Acquisition of these water rights is uncertain. Even if they could be acquired, they could not be acquired and construction completed soon enough to meet facility shortfalls. Necessary approvals and permits for construction, including completion of the National Environmental Policy Act (NEPA) compliance within the required time frame, is also uncertain.

Because of these uncertainties, the Authority would still have to plan and design additional Colorado River facilities in parallel, until these uncertainties were resolved. To move forward simultaneously with the CWP and additional Colorado River facilities, even prior to construction, would be costly. Colorado River facilities had to be expanded anyway, in order to capture existing Colorado River resources, and negotiations for additional Colorado River resources look promising. Thus, the Authority has chosen to expand those facilities, rather than build a CWP, to address its immediate facility problems.

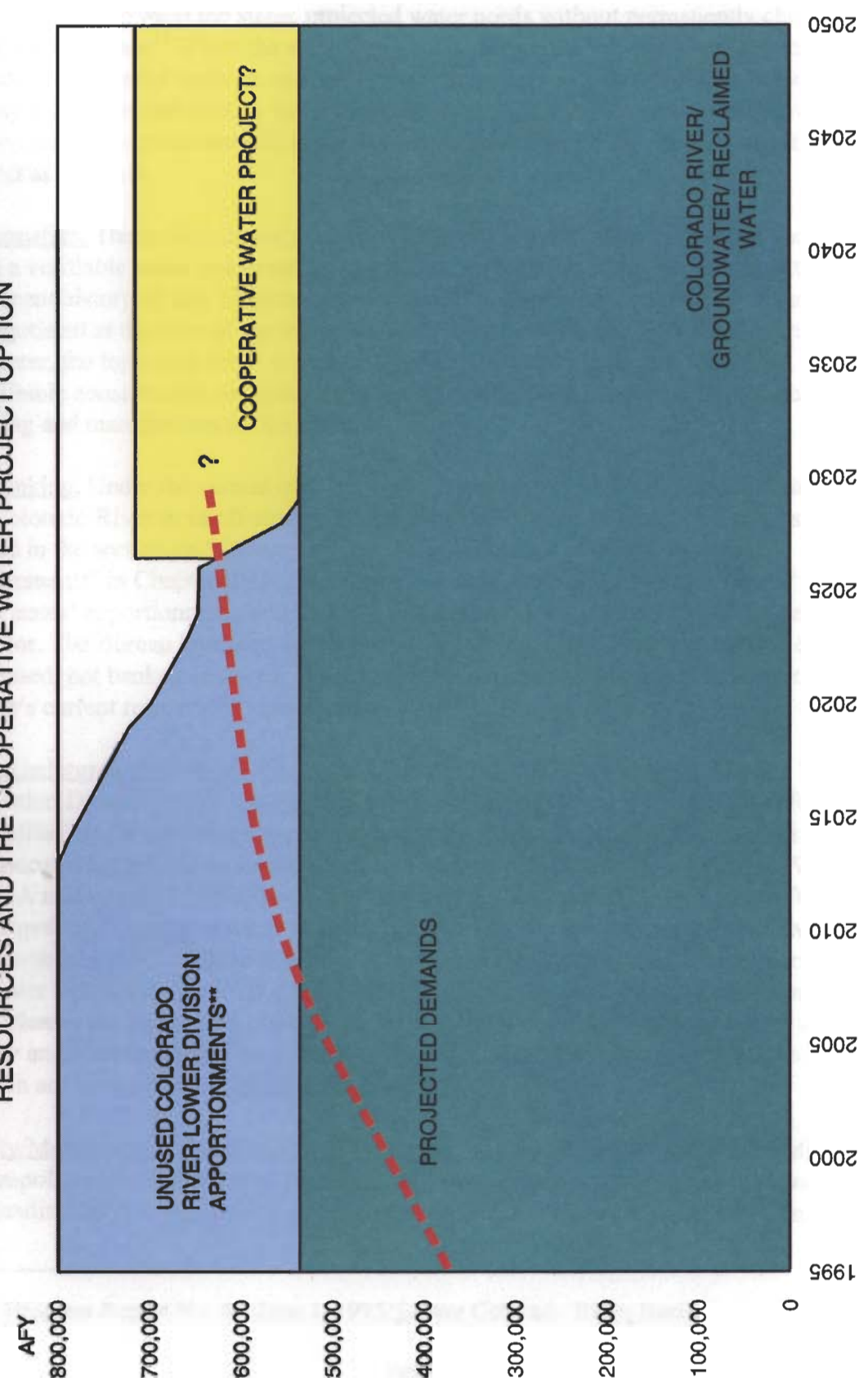
## COLORADO RIVER WATER TRANSFERS AND BANKING

The three lower division states of Arizona, California and Nevada; the Lower Colorado River

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<sup>13</sup> "Southern Nevada Water Authority Integrated Resource Plan: Phase 1 Progress Report," June 1995, Barakat & Chamberlin.

FIGURE IV.4:  
SNWA PURVEYOR DEMANDS\*, UNUSED APPORTIONMENTS, OTHER EXISTING  
RESOURCES AND THE COOPERATIVE WATER PROJECT OPTION



\*Includes potable and non-potable demands.

\*\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

Indian Tribes, and the Bureau of Reclamation have been working since 1994 on a "regional solution" that would meet the states' projected water needs without permanently changing their water apportionments.<sup>14</sup> While the work is not yet complete, two primary components of the "solution" are potential resource options -- water transfers and water banking. Figure IV.5 shows Authority water demands met by River transfers or banking after the year 2025. However, since these two resource options are still being discussed and defined, they are not quantified in this document at this time.

Water transfers. The current concept includes interstate transfer of water that has been conserved through a verifiable water conservation program or through the fallowing of agricultural land with a recent history of use. This conserved water would be leased, with the terms and conditions to be negotiated at the time of the lease. While there is also opportunity for interstate transfers of Tribal water, the topic still needs considerable discussion and agreement. Likewise, the concept of a verifiable conservation program needs further definition, as do the issues surrounding the accounting and management of this resource.

Water banking. Under the current concept, water could be "banked" or stored for later use, either on the Colorado River or in off-stream storage facilities or groundwater aquifers. As was discussed in the section on "Colorado River Water (Unused Lower Division States' Apportionment)" in Chapter III, the Authority currently has the right to a portion of unused lower division states' apportionment, with the size of the portion at the discretion of the Secretary of the Interior. The Bureau interprets current law to mean that unused apportionments can only be directly used, not banked or stored; thus, this banking resource option is different from the Authority's current resource of unused apportionments.

Arizona Underground Storage Demonstration Project. In 1993, the Central Arizona Water Conservation District (CAWCD), the Metropolitan Water District of Southern California (Metropolitan) and the Southern Nevada Water Authority entered into an agreement for a three-year demonstration project on underground storage of Colorado River water by CAWCD in Arizona. A maximum of 100,000 acre-feet was stored; the Authority purchased 50,000 AF, as did Metropolitan. The stored water is held in an escrow-type account, until one of two things occur. If a shortage of Colorado River water is declared by the Secretary of the Interior, then the stored water belongs to CAWCD. On the other hand, if anticipatory flood releases or flood control releases are made from Lake Mead, 90 percent of the stored water would be shared by the Authority and Metropolitan. The remaining 10 percent would be left underground in Arizona aquifers in accordance with Arizona state laws.

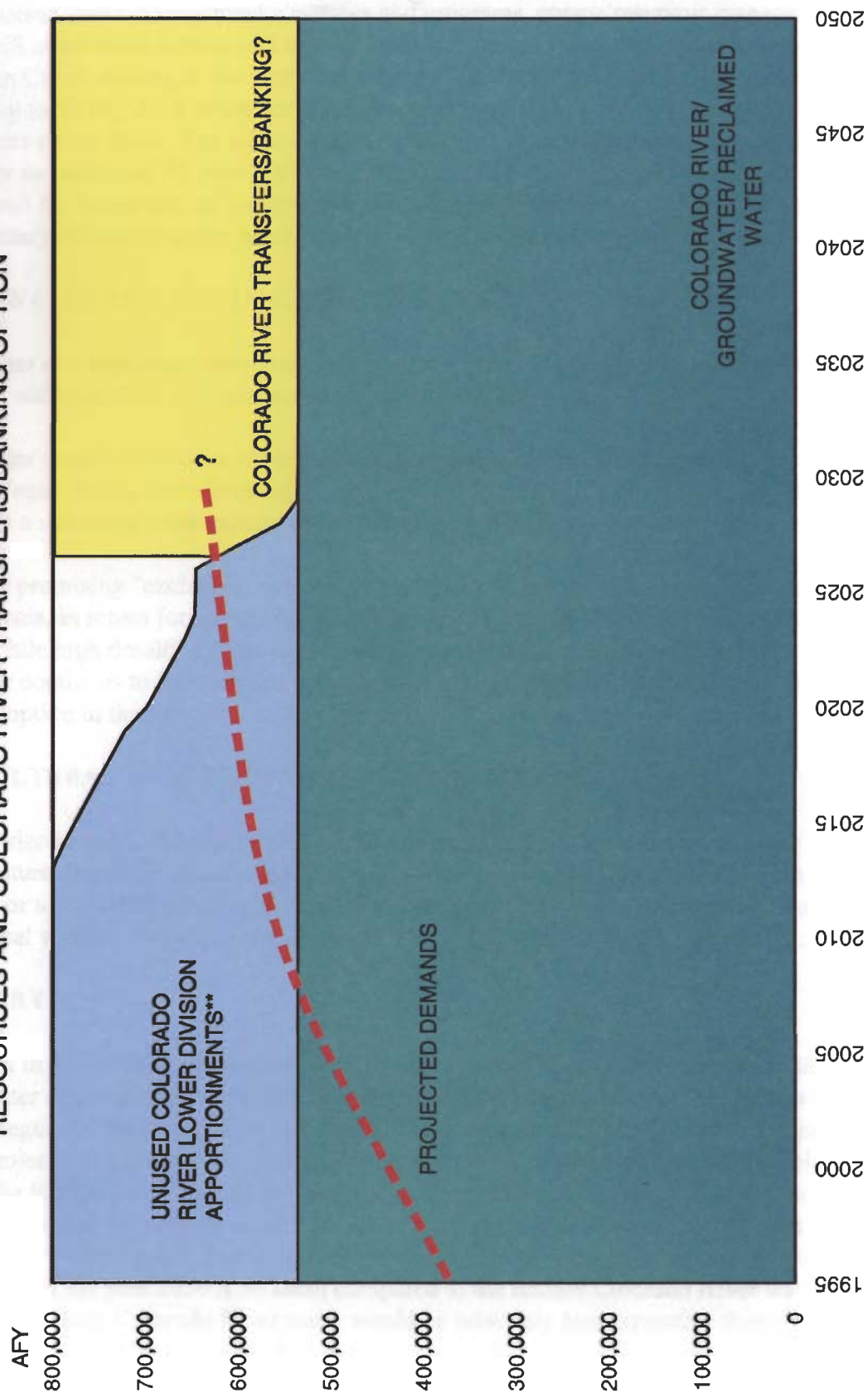
Authority/Metropolitan Memorandum of Understanding. In December 1995, the Authority and the Metropolitan Water District of Southern California (Metropolitan) signed a Memorandum of Understanding(MOU) establishing a partnership for the purpose of securing additional long-term

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<sup>14</sup> "Progress Report No. 4," June 1, 1995, Lower Colorado River Basin Technical Committee.



FIGURE IV.5:  
SNWA PURVEYOR DEMANDS\*, UNUSED APPORTIONMENTS, OTHER EXISTING  
RESOURCES AND COLORADO RIVER TRANSFERS/BANKING OPTION



\*Includes potable and non-potable demands.

\*\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

reliable supplies of Colorado River water. In the MOU, the Authority and Metropolitan agree to jointly pursue water management strategies and programs, pursue reservoir management criteria which will make more surplus and unused water available to each entity, and line the All-American Canal, sharing in the costs and benefits of the conserved water. The Authority could receive up to 30,000 AFY of conserved water, which would be about 54,000 AFY with wastewater return flows. The water could be available for up to 55 years, with the option to renew for an additional 55 years. Water not used directly by the Authority could be banked in Lake Mead for future use, an arrangement similar to that which Metropolitan already has with the Secretary of Interior under some of Metropolitan's existing water delivery contracts.

## STORMWATER AND EXCHANGES/DESALINIZATION

Stormwater and exchanges involving desalinization were dropped from further consideration at this time, although they may become more attractive in the future.

Stormwater's main drawbacks are its high cost, poor quality and small quantity. Rainstorms in the Las Vegas Valley are infrequent, short-lived and sporadic; high capture and treatment costs make this a relatively more expensive resource than other resource options.

The most promising "exchange" concept involved Las Vegas providing desalinization facilities in California, in return for the use by Las Vegas of a portion of California's Colorado River water. While high desalting costs kept this option from further consideration at this time, the Authority continues to keep abreast of new developments, and this may become a more desirable resource option in the future.

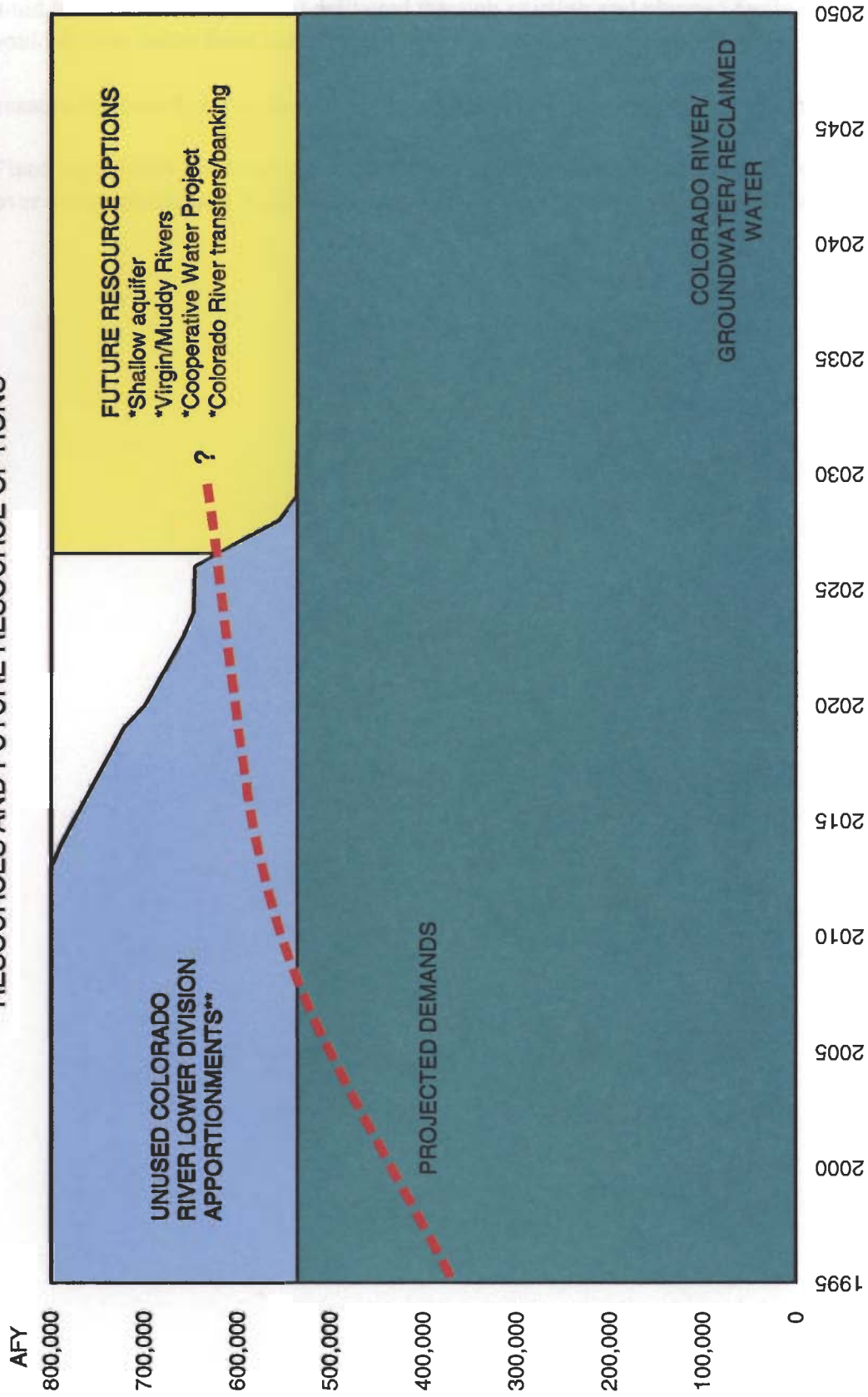
## AGRICULTURAL TO MUNICIPAL WATER CONVERSION

Unlike Arizona and California, which have large quantities of Colorado River water committed to agriculture, Southern Nevada has no Colorado River water used by agriculture. In times of drought, or to support increasing urban development, Nevada's neighboring states can convert agricultural water to municipal use. Southern Nevada does not have this option.

## SUMMARY

As shown in Figure IV.6, there are several resource possibilities for meeting the Authority's future water demands after the year 2025. Work on capturing portions of the shallow aquifer has already begun. Of the Authority's three relatively large options -- Virgin River, Cooperative Water Project and Colorado River transfers/banking -- the Authority plans to use Colorado River water. The likelihood of Nevada acquiring access to additional Colorado River water is at least as good as acquiring the permits and the public support to build a Virgin River pipeline or the Cooperative Water Project, particularly since the additional water needed to meet Nevada's needs through the year 2050 is so small compared to the unused Colorado River water available. Equally important, Colorado River water would be relatively less expensive than either the

FIGURE IV.6:  
SNWA PURVEYOR DEMANDS\*, UNUSED APPORTIONMENTS, OTHER EXISTING  
RESOURCES AND FUTURE RESOURCE OPTIONS



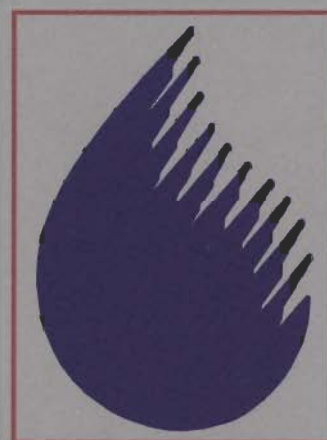
\*Includes potable and non-potable demands.

\*\*In addition to unused apportionments, surplus flows may be available, at the Secretary of Interior's discretion.

Virgin River or the CWP, and environmental impacts would be minimal or mitigated. River water would be captured, treated and delivered through existing and planned facilities, most of which would deliver water from Lake Mead to the Las Vegas Valley.

For the reasons discussed above, the Authority adopted the following policy in June 1995:

- 1.2 Place top priority on development of Colorado River water to meet future water demands, over development of a Virgin River pipeline or the Cooperative Water Project.



**CHAPTER V:**  
**Conclusion**

## **CHAPTER V**

### **CONCLUSION**

The Authority expects to be able to meet projected water demands for the next 30 to 35 years, with responsible conservation and full utilization of the Authority's existing water resources, including unused lower Colorado River division states' apportionments.

Water demands can be met from now until approximately 2010 by fully utilizing the Authority's existing long-term water supplies and continuing its conservation efforts. Existing long-term supplies include reclaimed water, current groundwater rights, pre-1992 Colorado River water rights, Colorado River water acquired from Southern California Edison and Basic Management Inc., and the Authority's 58,000 AFY Colorado River water from its 1992 contract with the Secretary of the Interior. Current conservation efforts are focused on the following:

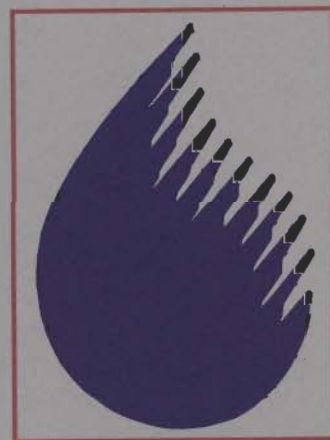
Implementation of the Bureau of Reclamation's "best management practices" agreed to in the Authority's Conservation Memorandum of Understanding adopted in 1994, completion of cost-benefit studies on various conservation measures, and the evaluation of impacts from the increasing of water rates -- the most effective conservation measure of all.

To meet water demands beyond the year 2010, the Authority believes its best option is to exercise the 1992 contractual right it has with the Secretary of the Interior, a right that is similar to one relied upon by California. This right provides for an annual distribution by the Secretary of the unused apportionments within the lower Colorado River. As shown in extensive river modeling conducted over the past year by the lower division states working in cooperation with the Tribes and the Bureau of Reclamation, it is projected that excess system water -- primarily unused lower division states' apportionments -- can sustain Nevada's projected water demands until some time after the year 2025. This is a critical resource for the Authority: It gives the community time to pay off costly expansions of existing facilities, and it gives the Authority time to secure additional water resources. Since unused apportionments are uncertain, however, the Authority must continue to aggressively pursue future resource options.

To meet water demands beyond the year 2025, future resource possibilities for the Authority are the use of the Las Vegas Valley shallow aquifer, construction of a Virgin River pipeline, construction of the Cooperative Water Project (CWP) to bring groundwater from Nevada's southeastern counties, and additional Colorado River water.

Utilization of the shallow aquifer has already begun in a few locations across the Valley and eventually could be fully developed. To meet its immediate facility needs, the Authority has begun expansion of its existing Colorado River facilities. To meet its longer-term resource needs, the Authority is focusing its efforts on acquiring additional Colorado River water, most of which would be delivered through existing and planned facilities from Lake Mead to the Las Vegas Valley, with the hope that construction of a Virgin River pipeline or a CWP will not be necessary. If additional Colorado River water does not materialize, however, the Authority must pursue other resources, to ensure a long-term, reliable water supply for the community.





## APPENDIX

**SOUTHERN NEVADA WATER AUTHORITY**  
**INTEGRATED RESOURCE PLAN ADVISORY COMMITTEE**  
**RECOMMENDATIONS**  
**(ADOPTED JUNE 1995 BY SNWA BOARD)**

**1.0 RESOURCES**

- 1.1 Seek permanent, long-term water supplies. However, a water resources plan should be formulated to meet future water demands that utilizes all available water supplies, including unused apportionments, surpluses, leases, and other water supplies.
- 1.2 Place top priority on development of Colorado River water to meet future water demands over development of a Virgin River pipeline or the Cooperative Water Project.
- 1.3 Maximize the use of the Las Vegas Valley shallow aquifer when and where practical.

**2.0 FACILITIES**

- 2.1 Implement a water facilities program that is phased and expandable in order to respond to future uncertainties (e.g., demands, regulations, etc.).
- 2.2 Expand the existing Southern Nevada Water System from its existing capacity of 400 million gallons per day (MGD) to its ultimate capacity of 600 MGD as soon as possible.
- 2.3 Maximize the reuse of wastewater when and where practical.
- 2.4 Maximize artificial recharge when and where practical.
- 2.5 Build a new treatment and transmission facility (TTF) as soon as possible that is big enough to be reliable (avoid shortages) and to provide backup capability in the event of a catastrophic failure.



### **3.0 CONSERVATION**

- 3.1 Achieve a 10% - 15% reduction in maximum day usage by summer 2000 through the "Planned" conservation program or something similar. For facility planning purposes, assume this reduction will occur until further study.
- 3.2 Study conservation possibilities immediately to see if a higher level than "Planned" is achievable, and incorporate as practical. Make adjustments to the facilities program as necessary.
- 3.3 Establish an SNWA water conservation committee to examine water conservation measures.
- 3.4 Promote economic incentives and provide economic information to encourage the efficient use of water.

### **4.0 FINANCE**

- 4.1 Study the impacts of water and wastewater programs on customer costs.
- 4.2 Study demand elasticity (i.e., the impact of customer costs on water demands).
- 4.3 Study different approaches to financing and rate setting.

### **5.0 PLANNING**

- 5.1 Continue the SNWA Integrated Resource Planning (IRP) process.
- 5.2 Integrate wastewater planning fully into the IRP process.
- 5.3 Maintain the SNWA Integrated Resource Plan Advisory Committee as a critical input to the IRP process.
- 5.4 Continue to update water demand projections as needed.

TABLE A.1  
NEVADA (NON-SNWA) UNUSED COLORADO RIVER APPORTIONMENT AVAILABLE TO SNWA  
ACRE-FEET PER YEAR (AFY)

Year	BMI Complex (a)		Fort Mohave		Indian Reservation (b)		Nellis AFB (c)		Lake Mead		Paboo (a)		Miscellaneous		Total unused NV apportionment	
	Demand	Resource	Demand	Resource	Demand	Resource	Demand	Resource	Demand	Resource	Demand	Resource	Demand	Resource	Available to SNWA (d)	Diversion
1995	8,608	8,608	-	-	333	12,534	12,201	4,000	2,000	2,000	1,000	1,000	30	30	12,201	21,961
2000	8,608	8,608	-	-	2,000	12,534	10,534	4,000	2,000	2,000	1,000	1,000	30	30	10,534	18,961
2005	8,608	8,608	-	-	3,667	12,534	8,867	4,000	2,000	2,000	1,000	1,000	30	30	8,867	15,961
2010	8,608	8,608	-	-	5,333	12,534	7,201	4,000	2,000	2,000	1,000	1,000	30	30	7,201	12,961
2015	8,608	8,608	-	-	7,000	12,534	5,534	4,000	2,000	2,000	1,000	1,000	30	30	5,534	9,961
2020	8,608	8,608	-	-	8,667	12,534	3,867	4,000	2,000	2,000	1,000	1,000	30	30	3,867	6,961
2025	8,608	8,608	-	-	10,333	12,534	2,201	4,000	2,000	2,000	1,000	1,000	30	30	2,201	3,961
2030	8,608	8,608	-	-	12,000	12,534	534	4,000	2,000	2,000	1,000	1,000	30	30	534	961
2035	8,608	8,608	-	-	12,534	12,534	-	4,000	2,000	2,000	1,000	1,000	30	30	-	-
2040	8,608	8,608	-	-	12,534	12,534	-	4,000	2,000	2,000	1,000	1,000	30	30	-	-
2045	8,608	8,608	-	-	12,534	12,534	-	4,000	2,000	2,000	1,000	1,000	30	30	-	-
2050	8,608	8,608	-	-	12,534	12,534	-	4,000	2,000	2,000	1,000	1,000	30	30	-	-

NOTES

- (a) Assumed demands equal resource.  
(b) Source: Colorado River Commission.  
(c) Source: Nellis AFB.  
(d) Diversion = Consumptive use \* 1.8 conversion factor.

**TABLE A.2**  
**UNUSED ARIZONA APPORTIONMENT AVAILABLE TO NEVADA**

Year	Arizona Demand (a)	Colorado River Consumptive use Apportionment	Unused Apportionment	Apportionment Available to Nevada (First 60,000 AF)	Apportionment Available to Nevada (27% >120,000)	Diversion amount Available to Nevada (b)
1995	2,134,000	2,800,000	666,000	60,000	147,420	373,356
2000	2,215,000	2,800,000	585,000	60,000	125,550	333,990
2005	2,215,000	2,800,000	585,000	60,000	125,550	333,990
2010	2,297,000	2,800,000	503,000	60,000	103,410	294,138
2015	2,427,000	2,800,000	373,000	60,000	68,310	230,958
2020	2,578,000	2,800,000	222,000	60,000	27,540	157,572
2025	2,712,000	2,800,000	88,000	60,000	-	108,000
2030	2,800,000	2,800,000	-	-	-	-
2035	2,800,000	2,800,000	-	-	-	-
2040	2,800,000	2,800,000	-	-	-	-
2045	2,800,000	2,800,000	-	-	-	-
2050	2,800,000	2,800,000	-	-	-	-

**NOTES**

(a) Source: 7/27/95 fax, Colorado River Commission.

(b) Diversion = Consumptive use \* 1.8 conversion factor.

**TABLE A.3**  
**UNUSED LOWER COLORADO RIVER DIVISION STATES' APPORTIONMENTS**  
**ACRE-FEET PER YEAR (AFY)**

Year	Unused Non-SNWA Nevada apportionments (Diversion quantities) (a)	Unused Arizona Apportionments (Diversion quantities) (b)	Total unused Apportionments Available to SNWA
1995	21,961	373,356	395,317
2000	18,961	333,990	352,951
2005	15,961	333,990	349,951
2010	12,961	294,138	307,099
2015	9,961	230,958	240,919
2020	6,961	157,572	164,533
2025	3,961	108,000	111,961
2030	961	-	961
2035	-	-	-
2040	-	-	-
2045	-	-	-
2050	-	-	-

**NOTES**

(a) See TABLE A.1

(b) See TABLE A.2